Silica Fume Cement

Solutions for greater strength and durability in concrete

Votorantim Cimentos

ST MARYS
St Marys Cement

WHY CHOOSE SILICA FUME CEMENT?

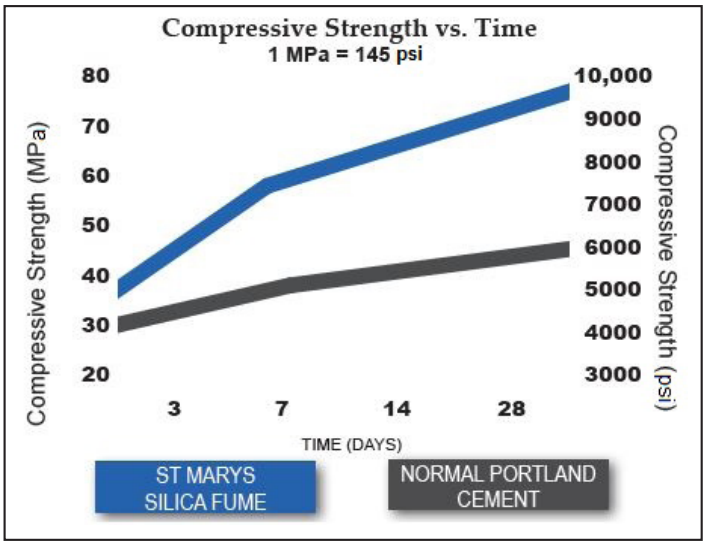
St Marys Silica Fume Cement combines a pre-determined percentage of silica fume with normal Portland cement clinker through an inter-grinding process. This superior and long-established cement offers the convenience of a blended product to the concrete producer, where no specialized handling of individual materials is required. St Marys Silica Fume Cement conforms to CSA A3001 Type GUb-SF and ASTM C595/ AASHTO M240 Type IP.

SUSTAINABILITY

Silica fume is a by-product from the manufacture of silicon metal. Our silica fume is over 90% pure silicon dioxide and is extremely fine, in fact, approximately 100 times finer than Portland cement. As a highly reactive pozzolan, silica fume combines with cement to enhance the strength and durability of concrete. The use of silica fume in concrete greatly contributes to extended service life and reducing life-cycle costs. As a result, concrete structures have lower environmental impacts contributing to achieving higher ratings towards sustainability in green building codes.

HIGHER COMPRESSIVE, FLEXURAL STRENGTH, AND MODULUS OF ELASTICITY

Silica Fume Cement is ideal for high performance concrete (HPC) where very high strength is required. It is commonly used in applications such as high-rise construction, HPC infrastructure, and shotcrete rehabilitation. Not only are higher compressive strengths easily attained, but there is also the added benefit of early strength gain. Concrete using Silica Fume Cement exhibits accelerated strength development, with less bleeding, resulting in early form stripping and quicker turnover. This is also beneficial to precast concrete manufacturers. Silica Fume Cement, when used in conjunction with Supplementary Cementitious Materials (SCM's) and in properly proportioned mix designs, can help to achieve high Modulus of Elasticity (MOE) concrete. High-MOE concrete contributes to reducing column sizes in high-rise construction and effectively increases the floor space in the resulting structure.



A representation of size relativity. The largest is a particle of portland cement, 60 times larger than the smallest - a particle of silica fume, (<1 micron across). The other two circles represent fly-ash and smoke particles for size comparison.

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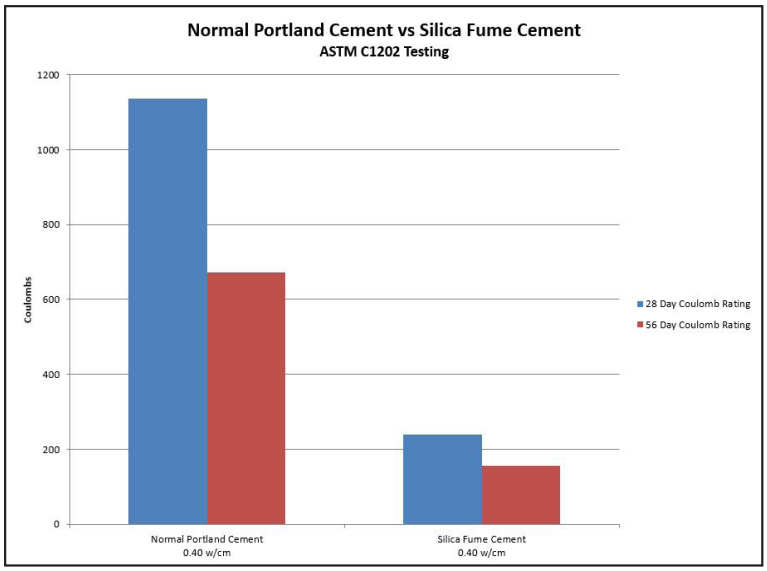
INCREASED RESISTANCE TO CHEMICAL ATTACK

Silica Fume Cement has proven to be effective in resisting alkali aggregate reactivity and sulphate attack, as well as the ingress of de-icing salts and other chemical agents. As a result the durability and service life of a structure is vastly improved.



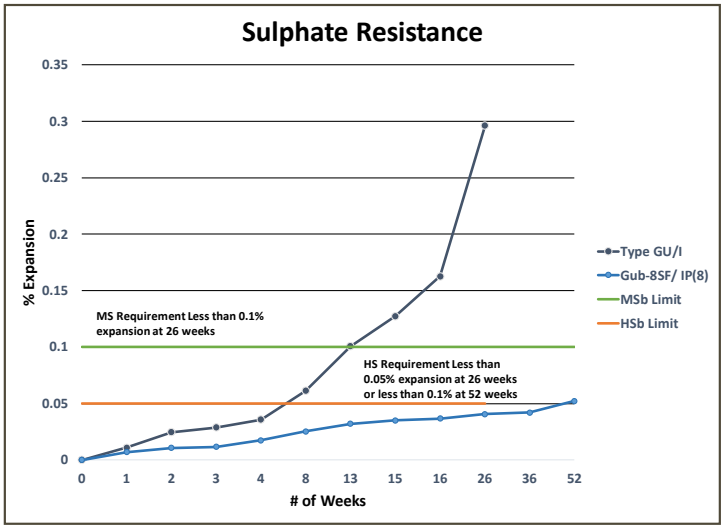
Chloride Permeability Rating					
Charged Passed	>4000	2,000-4,000	1,000-2,000	100-1,000	<100
Chloride Permeability Rating	High	Moderate	Low	Very Low	Negligible

DECREASED PERMEABILITY

Upon hydration, Silica Fume Cement produces a dense concrete with a pore structure that is less permeable than a standard concrete mix. The chart to the left shows the improved permeability of concrete mixtures incorporating 25% CemPlus™ slag cement with Portland cement and Silica Fume cement, when tested according to ASTM C1202 and CSA A23.2-23C. This feature makes Silica Fume Cement ideal for a wide range of applications; from containment tanks, to bridges and parking structures, to pipe manufacturing. With decreased permeability, Silica Fume Cement has been shown to be effective in protecting reinforcing steel

SULPHATE RESISTANCE

When tested according to CSA A3004-C8 and ASTM C1012, Silica Fume Cement exhibits high resistance to sulphate attack. Silica Fume Cement can be used for applications where sulphate resistance is required due to moderate or high levels of sulphates present in groundwater or soils.



INCREASED RESISTANCE TO ALKALI-SILICA REACTIONS (ASR)

Silica Fume Cement has proven to be effective in the mitigation of Alkali-Silica Reactivity (ASR) in concrete on its own and in combination with other Supplementary Cementitious Materials (SCM's). CSA A23.2-27A and ASTM C1778 recognize silica fume as an effective mitigation measure for ASR. The ability to mitigate ASR is dependant on the potential reactivity of the aggregates in use, as well as the concrete mix design. Mitigation measures proposed should be confirmed through applicable test methods using actual project materials.

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St Marys Cement has an experienced technical services department ready to provide assistance regarding the use of Silica Fume Cement in concrete.

For more information or specific needs such as Environmental Product Declarations (EPD's), Safety Data Sheets, and Product Data Sheets, contact your sales or technical services representative, or visit the St Marys Cement website at www.stmaryscement.com.

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